We Claim

1. A gas injection moulding method wherein a mould is provided comprising gas inlet and gas outlet apertures and the method includes the step of flowing the injection gas between the gas inlet and outlet apertures in use.

2. A gas injection moulding method using a mould having a melt inlet aperture, gas inlet aperture and gas outlet aperture comprising the following stages:
(a) injecting a melt into the mould;
(b) injecting gas from the inlet aperture in the mould into the melt to form a gas cavity within the melt;
(c) forming a gas channel between the gas cavity and the gas outlet aperture in the mould; and
(d) providing gas flow through the cavity between the gas inlet and outlet apertures.

3. An apparatus for gas injection moulding comprising a mould having inlet apertures for the ingress of gas and melt material into the mould, and outlet aperture for the egress of gas and melt from the mould and wherein use of the apparatus comprises the following stages:
(a) injecting a melt into the mould;
(b) injecting gas from an inlet aperture in the mould into the melt to form a gas cavity within the melt;
(c) forming a gas channel between the gas cavity and a gas outlet aperture in the mould, and
(d) providing gas flow through the cavity between the gas inlet and outlet apertures.

4. A gas injection moulding apparatus according to Claim 3 wherein the channel between the gas cavity and the outlet aperture is formed by forcing a stream of gas from the outlet aperture toward the cavity.

5. A gas injection moulding apparatus according to Claim 3 further comprising a movable needle wherein the channel between the gas cavity and the outlet aperture is formed by perforating the melt using the movable needle.

6. An apparatus for gas injection moulding according to Claim 3 wherein the mould apertures comprise injection needles and gas enters and/or exits the mould through the injection needles.

7. A gas injection needle for use in the apparatus for gas injection moulding in accordance with Claim 6 comprising a gas channel and movable member that can extend beyond the gas channel.

8. A gas injection needle for use in injection moulding comprising a gas channel and movable member that can extend beyond the gas channel.

9. A gas injection needle according to Claim 8 wherein the movable member is located coaxially within the gas channel.

10. A gas injection needle according to Claim 8 wherein the movable member is elongate and moves axially within the gas channel.

11. A gas injection needle according to Claim 8 wherein the moveable member is displaced to extend beyond the end of the gas channel.

12. A gas injection/exhaust needle for use in injection moulding comprising a gas channel and a shutoff member moveable by activating means from a closed position to an open position in which open position the shutoff member is retracted into the body of the needle.

13. A gas injection/exhaust needle according to Claim 12 wherein the shutoff member is located co-axially within the gas channel and/or is elongate and moveable axially within the gas channel.

14. A gas injection/exhaust needle according to Claim 12 wherein the activating means comprises a rod and piston activated pneumatically or hydraulically.

15. A gas injection/exhaust needle according to any of Claim 12 wherein the activating means comprises a rod and piston the shutoff member being moveable to the open position by the action injection gas pressure on a first face of the piston.

16. A gas injection/exhaust needle according to Claim 15 wherein the shutoff member is moveable to the closed position by the application of pneumatic pressure on a second face of the piston.

17. A gas injection/exhaust needle according to Claim 12 wherein the injection gas exits or enters the gas channel through an aperture at the open end of the gas channel.

18. A gas injection/exhaust needle according to Claim 12 when the injection gas exits or enters the gas channel through at least one aperture located in the wall of the gas channel.

19. A gas injection/exhaust needle according to Claim 18 wherein the injection gas exits or enters the gas channel at an angle to the axis of the gas channel, or enters the gas channel radially.

20. A gas injection/exhaust needle according to any of Claim 18 wherein the end of the gas channel is sealed.

21. A gas injection moulding method comprising injecting a melt into a mould and injecting gas into the melt to form a gas cavity in the melt, wherein the injected gas is at least partly vented during the melt cooling stage in order to cool the injected gas by thermodynamic effect, such as the Joule-Thompson effect, and so enhance the cooling effect.

22. A method according to Claim 21 wherein the injection gas is vented in steps through a plurality of pressure levels.

23. A method according to Claim 21 wherein additional gas is injected into the mould after a venting step in order to increase the pressure of the gas cavity within the melt.

24. A method according to Claim 21 wherein the pressure of the gas within the cavity of the melt is restored to the pressure therein before venting.

25. A gas injection moulding method comprising injecting a melt into a mould and injecting gas into the melt to form a gas cavity in the melt, wherein the injection gas is cooled to below the external ambient air temperature before being injected into the melt.

26. An apparatus according to Claim 3 wherein the temperature of the injection gas is in the range of 0° C to -176° C.

27. An apparatus according to Claim 3 wherein the temperature of the injection gas is in the range of -10° C to -50° C.

28. An apparatus according to Claim 3 wherein the gas pressure in the mould is in the range 10 to 350 bar and/or the injection gas is nitrogen.

29. An apparatus according to Claim 3 comprising a heat exchanger to cool the injection gas prior to injection into the mould.

30. A gas injection moulding apparatus according to Claim 29 wherein the heat exchanger comprises a coiled portion of piping through which the injection gas flows, the coiled portion of piping being immersed in a liquid at a lower temperature than the initial temperature of the injection gas.